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特許協力条約に基づいて公開された国際出願

(51) 国際特許分類5 F23C 11/02, F23G 5/00	A1	(11) 国際公開番号	WO 90/09549
		(43) 国際公開日	1990年8月23日(23. 08. 1990)

(21) 国際出願番号 PCT/JP90/00187
(22) 国際出願日 1990年2月16日(16. 02. 90)

(30) 優先権データ
特願平1/37870 1989年2月17日(17. 02. 89) JP

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(81) 指定国
AT(欧州特許), BE(欧州特許), CA, CH(欧州特許),
DE(欧州特許), DK(欧州特許), ES(欧州特許), FR(欧州特許),
GB(欧州特許), IT(欧州特許), JP, LU(欧州特許),
NL(欧州特許), SE(欧州特許), US.

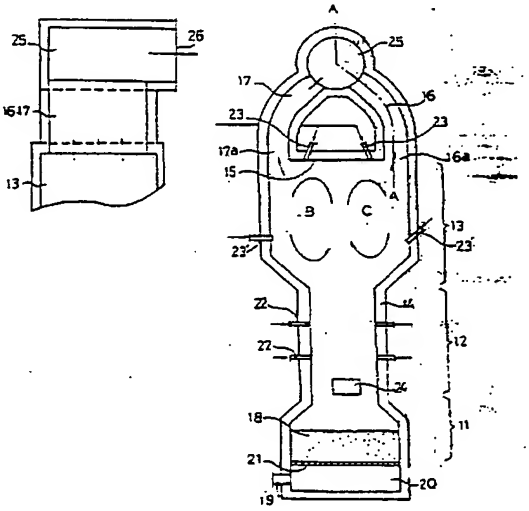
添付公開書類 国際調査報告書

(54) Title: FLUIDIZED BED COMBUSTION FURNACE

(54) 発明の名称 流動床燃焼炉

(57) Abstract

A fluidized bed combustion furnace having a constricted portion (12) at that part of the furnace which is immediatly above a fluidized bed (18), in which constricted portion the flow rate of a combustion gas exceeds the terminal speed of the particles having an average diameter of a fluidizing medium; a plurality of steps secondary air supply ports (22) provided in the wall of the constricted portion; a freeboard portion (13) formed on the constricted portion and having a cross section that causes the flow rate of a combustion gas to fall short of the terminal speed of the particles having an average diameter of the fluidizing medium; at least two combustion gas inlets (16a, 17a) of a combustion gas passages (16, 17), which are formed at that part of the ceiling zone of the freeboard portion which is outside a plane of projection of the constricted portion; and a confluence chamber (25) provided at the outlet portions of the combustion gas passages, in which confluence chamber the combustion gas currents from the combustion gas passages collide with one another and join one another.



(57) 要約

流動床(18)の直上に流動媒体の平均粒径の粒子の終末速度以上の燃焼ガス流速となる絞り部(12)を形成し、該絞り部に二次空気供給口(22)を複数段配置すると共に、その上部に流動媒体の平均粒径粒子の終末速度以下となるような横断面積を持つフリーボード部(13)を形成し、該フリーボード部の天井部の前記絞り部の投影面以外の部分に燃焼ガス通路(16),(17)の燃焼ガス入口(16a),(17a)を2個以上設け、該燃焼通路の出口部に該燃焼ガス通路からの燃焼ガスが衝突合流する合流室(25)を設けた構成の流動床燃焼炉。

INTERNATIONAL SEARCH REPORT

International Application No PCT/JP90/00187

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl[5] F23C11/02, F23G5/00

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC	F23C11/02, F23G5/00, F23G5/30

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

Jitsuyo Shinan Koho	1926 - 1989
Kokai Jitsuyo Shinan Koho	1971 - 1989

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
Y	Microfilm of Utility Model Application No.110408/1980 (JP, U, 18510/1987. Ishikawajima-Harima Heavy Industries Co., Ltd.), 4 February 1987 (04. 02. 87), Lines 1 to 9, page 5, lines 9 to 17, page 6, (Family: none)	1 - 5
Y	Microfilm of Utility Model Application No.68990/1983 (JP, U, 175849/1984. Toyoda Kihan K.K.), 24 November 1984 (24. 11. 84), Line 11, page 6 to line 16, page 7, line 11, page 12 to line 1, page 13, (Family: none)	1 - 5
Y	JP, A, 54-7779 (Enage Prodactsu of Idaho), 20 January 1979 (20. 01. 79), Line 14, upper left column to line 12, upper right column; page 6 & US, A, 4,075,953	1 - 5

* Special categories of cited documents: [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
May 9, 1990 (09. 05. 90)	May 21, 1990 (21. 05. 90)
International Searching Authority	**Signature of Authorized Officer**
Japanese Patent Office	

国　際　調　査　報　告

国際出願番号PCT/JP90/00187

I. 発明の属する分野の分類

国際特許分類（IPC）Int. Cl⁵
F23C11/02, F23G5/00

II. 国際調査を行った分野

調査を行った最小限資料

分類体系	分類記号
IPC	F23C11/02, F23G5/00, F23G5/30

最小限資料以外の資料で調査を行ったもの

日本国実用新案公報　1926－1989年
日本国公開実用新案公報　1971－1989年

III. 関連する技術に関する文献

引用文献のカテゴリー※	引用文献名　及び一部の箇所が関連するときは、その関連する箇所の表示	請求の範囲の番号
Y	実願昭60－110408号（JP, U, 62－18510）のマイクロフイルム（石川島播磨重工業株式会社），4. 2月. 1987（04. 02. 87），第5頁第1－9行，第6頁第9－17行（ファミリーなし）	1－5
Y	実願昭58－68990号（JP, U, 59－175849）のマイクロフイルム（株式会社　豊田機販），24. 11月. 1984（24. 11. 84），第6頁第11行－第7頁第16行，第12頁第11行－第13頁第1行（ファミリーなし）	1－5
Y	JP, A, 54－7779（エナアジイ・プロダクツ・オブ・アイダホウ），20. 1月. 1979（20. 01. 79），第6頁上左欄第14行－上右欄第12行	1－5

※引用文献のカテゴリー
「A」特に関連のある文献ではなく、一般的技術水準を示すもの
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「&」同一パテントファミリーの文献

IV. 認　証

国際調査を完了した日	国際調査報告の発送日
09. 05. 90	21.05.90
国際調査機関	権限のある職員
日本国特許庁（ISA/JP）	特許庁審査官　河合厚夫　3K 6478

様式PCT/ISA/210（第2ページ）（1981年10月）

第2ページから続く情報

（Ⅰ欄の続き）

&US, A, 4,075,953

V. ☐ 一部の請求の範囲について国際調査を行わないときの意見

次の請求の範囲については特許協力条約に基づく国際出願等に関する法律第8条第3項の規定によりこの国際調査報告を作成しない。その理由は、次のとおりである。

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VI. ☐ 発明の単一性の要件を満たしていないときの意見

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   請求の範囲＿＿＿＿
3. ☐ 追加して納付すべき手数料が指定した期間内に納付されなかったので、この国際調査報告は、請求の範囲に最初に記載された発明に係る次の請求の範囲について作成した。
   請求の範囲＿＿＿＿
4. ☐ 追加して納付すべき手数料を要求するまでもなく、すべての調査可能な請求の範囲について調査することができたので、追加して納付すべき手数料の納付を命じなかった。

追加手数料異議の申立てに関する注意

☐ 追加して納付すべき手数料の納付と同時に、追加手数料異議の申立てがされた。
☐ 追加して納付すべき手数料の納付に際し、追加手数料異議の申立てがされなかった。

FLUIDIZED BED COMBUSTION FURNACE

Background of the Invention

1. Field of the Invention

The present invention relates to a fluidized bed combustion furnace. More particularly, the present invention relates to a fluidized bed combustion furnace which is good to improve the mixture of second air and unburned gas from a fluidized bed, and protect a fluid substance from dispersing from a free board and further crash high temperature gases into each other in a confluent room and perfectly combust slight unburned gases such as CO and the like.

2. Field of the Invention

A fluidized bed combustion furnace requires a free board to again sink fluid substance, such as sand and the like, which is dispersed in a fluidized bed. This fluid substance is dispersed from the free board if a flow velocity of combustion gas raised through the free board is too fast. Thus, the flow velocity of the combustion gas in the free board is limited to about 2 m/s. Hence, the free board is typically configured such that its cross-sectional area (horizontally sectional

area) is wider than a cross-sectional area (a horizontally sectional area) of the fluidized bed.

However, in a case of such configuration, the flow velocity of the combustion gas in the free board is slow. Thus, even if second air is supplied to the free board, this flow velocity causes the sufficient mixture of the unburned gas and the air to be difficult. As a result, a second combustion efficiency becomes low. So, various proposals with regard to an air supplying method in the free board have been proposed in order to promote the mixture of the unburned gas and the air. However, the actual situation is such that since the cross-sectional area of the free board is wide, its effect is not sufficiently provided.

Also, a method of installing a throttling unit on an upper portion of a fluidized bed is proposed, for example, as disclosed in Japanese Laid Open Utility Model Application (JP-A-Showa, 62-18510). However, if the throttled amount by the throttling unit is too large, the flow velocity of the fluid substance is equal to or faster than an end velocity of an average particle diameter particle. Thus, the amount of the fluid substances dispersed from the free board becomes enormous, which thereby

終末速度

requires a device for carrying out the return of the dispersed sands.

Also, many dead spaces that do not contribute to the combustion are brought about in a spread gap between the throttling units, which is caused by installing the throttling units in multiple stages, or the gap caused by the shape of the free board. This results in a problem that the air, which serves as the second air and the like and is blown into the furnace, is not effectively used.

Thus, such a facility has a problem that it is necessary to reduce the throttled amount by the throttling unit or that the device for returning the dispersed sands is required.

Also, there is a method of using an assistant burner to increase a temperature of the fluid substance such as the sand and the like, or a method of increasing the combustion amount to thereby make an air ratio lower, in the conventional fluidized bed combustion furnace. However, the assistance burner requires an assistant fuel, which is not economic. Also, the operation of the lower air ratio has a problem of an occurrence of unburned gas such as CO gas and NH_3 gas.

The present invention is accomplished in

view of the above mentioned problems. Therefore, an object of the present invention is to provide a fluidized combustion furnace, which makes a combustion gas flow velocity at a throttling unit equal to or faster than an end velocity (about 2 to 8 m/s) of an average particle diameter particle of a fluid substance in a fluidized bed, and effectively sinks dispersed fluid substances in a free board, and then minimizes the dispersion from the free board of the fluid substances, and also improves the mixture of unburned gas and second air, and further crashes high temperature combustion gases branched from the free board into each other in a confluent room and mixes them, and thereby enables slight unburned materials to be perfectly combusted, and does not require any assistant fuel to increase a temperature of the fluid substance in the fluidized bed and does not bring about any occurrence of unburned gas such as CO gas and NH_3 gas.

Summary of the Invention

In order to attain the above-mentioned object, in the present invention, the fluidized bed combustion furnace is designed as follows.

A throttling unit for providing a combustion gas flow velocity equal to or faster

than an end velocity of an average particle diameter particle of fluid substances is installed just above a fluidized bed, and a plurality of stages of second air supply ports are formed in the throttling unit, and a free board having a cross-sectional area (a horizontal section) is placed on an upper portion thereof so as to provide a velocity equal to or slower than the end velocity of the average particle diameter particle of the fluid substances, and two or more combustion gas inlets for combustion gas paths are installed in portions except a vertical projection plane of the throttling unit to a ceiling of the free board, and a confluent room in which combustion gases from the combustion gas paths are crashed into and merged with each other is installed in outlets of the combustion paths.

Also, third air supply ports to blow third air horizontally or downwardly are installed in the vicinities of the combustion gas paths and a lower side wall of the free board.

Also, the second air supply port is installed so as to downwardly blow a second air.

Also, the second air supply port installed in the throttling unit is installed at a predetermined angle with a tangential direction

of a furnace wall of a cross-section (a horizontal section) of a furnace.

Brief Description of Drawings

Fig. 1A is a longitudinally sectional view showing a schematic structure of a fluidized bed combustion furnace according to the present invention, and Fig. 1B is an A-A sectional view of Fig. 1A. Fig. 2A is a longitudinally sectional view showing a schematic structure of another fluidized bed combustion furnace according to the present invention, and Fig. 2B is a view showing a flow of second air in a throttling unit in Fig. 1A.

Description of the Preferred Embodiments

An embodiment to embody the present invention will be described below with reference to the drawings.

Fig. 1A is a longitudinal sectional view showing a schematic structure of a fluidized bed combustion furnace showing an embodiment of the present invention, and Fig. 1B is an A-A sectional view of Fig. 1A.

As shown Figs. 1A, 1B, in the fluidized bed combustion furnace, a throttling unit 12 is installed just above a fluidized bed 11, and a free board 13 having a cross-sectional area wider than a cross-sectional area (a horizontally

sectional area) of the throttling unit 12 is installed just above the throttling unit 12. Also, a ceiling 15 having an area wider than the cross-section of the throttling unit 12 is installed on the uppermost portion of this free board 13.

Combustion gas inlets 16a, 17a for combustion gas paths 16, 17 are symmetrically installed on the portions except the projection plane of the throttling unit 12 of the ceiling 15 of this free board 13. Outlets of the combustion gas paths 16, 17 are opened in a confluent room 25. Moreover, the confluent room 25 is linked to an exhaust gas outlet 26.

A piping 19 for sending the fluidized air for fluidizing the sand serving as a fluid substance of a fluidized bed 18, namely, the first air, an air room 20 and a dispersion plate 21 and the like are installed in a lower portion of the fluidized bed 11. Also, a plurality of second air supply ports 22 (two stages in Fig. 1A) for horizontally blowing and supplying the second air are formed in a furnace wall 14 of the throttling unit 12. A plurality of third air supply ports 23, 23' (respectively two in Fig. 1A) for supplying the third air downwardly or horizontally are formed in the vicinities of the

combustion gas inlets 16a, 17a of the combustion gas paths 16, 17 of the ceiling 15 of the free board 13 and a lower side wall of the free board 13.

By the way, 24 in Fig. 1A denotes a combustion material supply port to supply combustion materials such as coal and the like.

The first air is supplied from the piping 19 to the air room 20, and supplied from a lower portion of the fluidized bed 18 through the dispersion plate 21. Although the second air is supplied from the second air supply ports 22 formed in the furnace wall 14 of the throttling unit 12, the cross-section (the horizontal section) of the throttling unit 12 is narrow, and the combustion gas flow velocity becomes equal to or faster than an end velocity (about 2 to 8 m/s) of an average particle diameter particle of the sand. Thus, the effect of the mixture of the unburned gas and the second air is promoted. The particle diameter of the sand in the fluidized bed 18 is about 0.2 mm to 0.8 mm, and the second air supply port 22 is formed so as to be separated by a proper height from a bed plane (an upper plane of a sand layer) of the fluidized bed 18. That is, if the second air supply ports 22 are too close to the bed plane of

the fluidized bed 18, the sands blown up from the bed plane are all moved to the free board 13. Also, if they are too far away from the bed plane of the fluidized bed 18, flame is separated from the bed plane (the upper plane of the sand layer) of the fluidized bed 18, and the unburned gas is increased. Thus, the height of the second air supply port 22 from the bed plane of the fluidized bed 18 is desired to be about 1 to 5 mm.

By the way, even in this case, a part of the sands is blown up to the second air supply port 22 of the throttling unit 12. Most of them exceed the end velocity, and they are blown up to the free board 13. On the other hand, in a case of one outlet for the combustion gas of the free board 13, the combustion gas blown up from the throttling unit 12 is raised while the dead space is formed in the portion except the projection plane of the throttling unit 12 in the cross-section (the horizontal section) of the free board 13. As if the cross-section narrower than the cross-section of the designed free board is used as the combustion gas path, the actual combustion gas flow velocity is faster than the designed combustion gas flow velocity, which results in a problem that it is impossible to

reserve a stay time required to combust the unburned gas and a problem that the fast flow velocity causes the sand arriving at the free board to be dispersed from the furnace.

On the contrary, as described in this embodiment, if the combustion gas inlets 16a, 17a for the combustion gas paths 16, 17 are symmetrically installed on the end portions except the projection plane of the throttling unit 12 of the ceiling 15 of this free board 13, the combustion gas within the free board 13 is branched right and left in the vicinity of the ceiling 15. That is, it becomes two symmetrical circular flows composed of an upward flow and a downward flow when they are viewed from the longitudinally sectional direction of the furnace (refer to circular flows B, C of Fig. 1A). Thus, the dead space in which the unburned gas does not flow through the free board 13 can be removed to thereby reserve the stay time required to combust the unburned gas.

Also, if the outlet for the combustion gas is located at the upper center of the free board 13, the sand blown up to the throttling unit 12 is ridden on the flow of the combustion gas and sent out from the furnace. However, the

above-mentioned configuration causes most of the sands, which are blown up and raised, to be crashed into the ceiling 15 of the free board 13 and dropped. Thus, it is possible to reduce the outflow of the sands from the furnace.

Also, most of the sands blown up from the throttling unit 12 are slowed down in the free board 13, and the sand layer of a high temperature is formed in the lower portion of the free board 13. Moreover, they are sunk on the bed plane (the upper plane of the sand layer) of the fluidized bed 18 along the inner wall of the throttling unit 12. Since the unburned gas is passed through this sand layer, the reaction is promoted.

The third air is supplied downwardly through a third air supply port 23 from the vicinities of the combustion gas inlets 16a, 17a for the combustion gas paths 16,17 of the ceiling 15 of the free board 13. Thus, the combustion gas downwardly flows, which results in the generation of the circulation of the combustion gas within the free board 13. The third air may be further added horizontally or downwardly through the third air supply port 23 from the lower side wall of the free board 13. Moreover, the action of the downward flow of

this circulation flow protects the sands from being dispersed to the combustion gas paths 16, 17 from the combustion gas inlets 16a, 17a.

Also, the high temperature combustion gases flowing into the combustion gas paths 16, 17 from the combustion gas inlets 16a, 17a symmetrically formed on both of the ends of the ceiling 15 are sent into the confluent room 25 through the symmetrically formed combustion gas paths 16, 17 having the cross-sections in which the flow velocities are between 10 m/s and 20 m/s, and are oppositely crashed into each other at the substantially same flow rates within the confluent room 25, and mixed with each other. Thus, the combustion of the unburned components remaining in the combustion gas is further promoted in the confluent room 25.

Fig. 2A is a longitudinally sectional view showing the schematic structure of another fluidized bed combustion furnace according to the present invention, and Fig. 2B is a view showing a flow of second air in a throttling unit in Fig. 2A. In Figs. 2A, 2B, the portions having the same symbols as those of Figs. 1A, 1B indicate the same or corresponding portions. As shown in Figs. 2A, 2B, in this embodiment,

the second air supply ports 22 formed in the furnace wall 14 of the throttling unit 12 are placed such that the number of the stages is two, the second air flow is downwardly supplied, and the supplied second air is further circulated within the throttling unit 12 as shown in Fig. 2B. That is, the second air supply ports 22 are downwardly formed at a predetermined angle with a tangential direction of the furnace wall 14 on the cross-section of the furnace.

In the fluidized bed combustion furnace having the above-mentioned structure, when the temperature of the sand in the fluidized bed 18 is desired to be increased, the second air is downwardly blown from the second air supply port 22 of the first stage. Then, flame is generated near the bed plane (the upper plane of the sand layer) of the fluidized bed 18 to thereby increase the temperature of the sand. Also, the second air from the second air supply port 22 of the second stage is normally blown.

By the way, the second air supply ports 22 may be formed at three stages or more.

Also, for example, the exhaust gas from the exhaust gas outlet 26 may be again circulated as the second air and the third air.

Since the fluidized bed combustion furnace

is configured as mentioned above, it is not necessary to use the assistant burner in order to increase the temperature of the sand serving as the fluid substance, or it is not necessary to increase the combustion amount to thereby make the air ratio lower. Thus, any assistant fuel is not needed. Moreover, there is no occurrence of the unburned gas such as CO gas and NH_3 gas.

As mentioned above, according to the present invention, the excellent effect can be obtained as follows.

The combustion gas flow velocity in the throttling unit 12 becomes fast (equal to or faster than the end velocity of the average particle diameter particle of the fluid substance), and the mixture of the unburned gas and the second air is promoted.

Also, the fluid substance from the fluidized bed 18 is blown up and raised through the free board 13. However the free board 13 is designed such that its cross-sectional area (the horizontally sectional area) is wider than the horizontally sectional area of the throttling unit 12, and it becomes the gas flow velocity equal to or less than the end velocity of the fluid substance. Moreover, the ceiling 15 is

located on the uppermost portion thereof, and the combustion gas inlets of the two or more combustion gas paths (in the embodiment, the combustion gas inlets 16a, 17a for the two combustion gas paths 16, 17 on the right and left sides) are symmetrically installed on the ceiling 15 except the projection plane of the throttling unit 12. Thus, the raised combustion gas and the fluid substance are crashed into this ceiling 15, and the unburned gas is branched into each of the symmetrically arranged combustion gas paths. At this time, the fluid substance in company with the combustion gas is crashed into the ceiling 15, and separated from the raised unburned gas. Hence, the fluid substance is protected from being dispersed from the free board 13.

Also, the two or more combustion gas paths 16, 17 are symmetrically arranged in the portions except the projection plane of the throttling unit 12 of the ceiling 15. Moreover, the third air supply ports 23 are downwardly or horizontally installed in the vicinities of the respective combustion gas paths 16, 17 and the lower side wall of the free board. Thus, the third air is not horizontally blown, and it is blown at the certain angle with the flow of the

combustion gas. Thus, the combustion gas becomes positively at the turbulent flow state, and generates the two symmetrical large circulation flow composed of the upward flow and the downward flow when they are viewed from the longitudinally sectional direction of the furnace. Hence, the sufficient stay time of the combustion gas is reserved in the entire free board 13 without any occurrence of the dead space in the free board 13. After that, the combustion gases are exhausted from the combustion gas paths 16, 17, and merged with each other in the confluent room 25 of the upper portion thereof, and crashed into each other. Hence, the slight unburned gas remaining in the combustion gas is perfectly combusted in the confluent room 25, and the perfectly combusted combustion gas is exhausted from the exhaust gas outlet 26 to an external portion.

The above-mentioned effect enables the average flow velocity of the combustion gas passed through the cross-section of the free board 13 to be kept at the flow velocity equal to or slower than the end velocity of the fluid substance, and it can also provide the fluidized bed combustion furnace having the excellent combustion efficiency.

On the other hand, as for the fluid substances blown up together with the combustion gas raised through the free board 13, most of them are separated and sunk because of the reduction in the gas flow velocity in the free board 13. However a part of the fluid substances in company with the combustion gas is crashed into the ceiling 15, and separated. Again, the action of the downward flow of the circulation flow causes it to be effectively sunk in the lower portion of the free board 13. Also, as shown in Fig. 2A, when the second air supply port 22 to downwardly blow the second air is formed in the throttling unit 12, if the temperature of the fluid substance of the fluidized bed 18 is desired to be increased, the frame is reversely blown onto the bed plane (the upper plane of the sand layer) of the fluidized bed 18 without being ridden on the flow of the combustion gas and blown upwardly. Thus, it is not necessary to use the conventional assistant burner, or to increase the combustion amount to thereby make the air ratio lower.

Also, since the second air supply port 22 is arranged at the predetermined angle with the tangential direction of the cross-section (the horizontal section) of the throttling unit 12, as

shown in Fig. 2B, the above-mentioned effect is further promoted.

Advantageous Effects of the Invention

As mentioned above, the fluidized bed combustion furnace according to the present invention is designed such that the throttling unit for providing the combustion gas flow velocity equal to or faster than the end velocity of the particle of the average particle diameter of the fluid substances is installed just above the fluidized bed, and the plurality of stages of second air supply ports are formed in the throttling unit, and the free board having the cross-sectional area is placed on the upper portion thereof so as to provide the velocity equal to or slower than the end velocity of the average particle diameter particle of the fluid substances, and the two or more combustion gas inlets for the combustion gas paths are installed in the portion except the projection plane of the throttling unit of the ceiling of the free board, and the confluent room in which the combustion gases from the combustion gas paths are crashed into and merged with each other is installed in the outlet of the combustion path. Thus, the average flow velocity of the combustion gases passed through the cross-section of the free

board can be kept at the flow velocity equal to or slower than the end velocity of the fluid substance. Hence, it is possible to sufficiently reserve the stay time in the free board of the combustion gas. Moreover, the slight unburned gas in the combustion gas can be combusted in the above-mentioned confluent room. Therefore, it is possible to provide the fluidized bed combustion furnace having the excellent combustion efficiency.

What is claimed is:

1. A fluidized bed combustion furnace characterized in that a throttling unit for providing a combustion gas flow velocity equal to or faster than an end velocity of an average particle diameter particle of fluid substances is installed just above a fluidized bed, and a plurality of stages of second air supply ports are formed in the throttling unit, and a free board having a cross-sectional area is placed on an upper portion thereof so as to provide a velocity equal to or slower than the end velocity of the average particle diameter particle of the fluid substances, and two or more combustion gas inlets for combustion gas paths are installed in portions except a vertical projection plane of said throttling unit to a ceiling of the free board.

2. A fluidized bed combustion furnace according to claim 1, characterized in that third air supply ports are formed horizontally or downwardly in the vicinities of said combustion gas paths and a lower side wall of the free board.

3. A fluidized bed combustion furnace according to claim 1 or 2, characterized in that said second air supply port is formed so as to

downwardly blow a second air.

4. A fluidized bed combustion furnace according to claim 1 or 2 or 3, characterized in that the second air supply port formed in said throttling unit is formed at a predetermined angle with a tangential direction of a furnace wall of a cross-section of a furnace.

5. A fluidized bed combustion furnace according to claim 1 or 2 or 3 or 4, characterized in that a confluent room in which high temperature gases passed through the combustion gas paths are crashed into each other is installed in outlets of said plurality of combustion gas paths.

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Fig 1

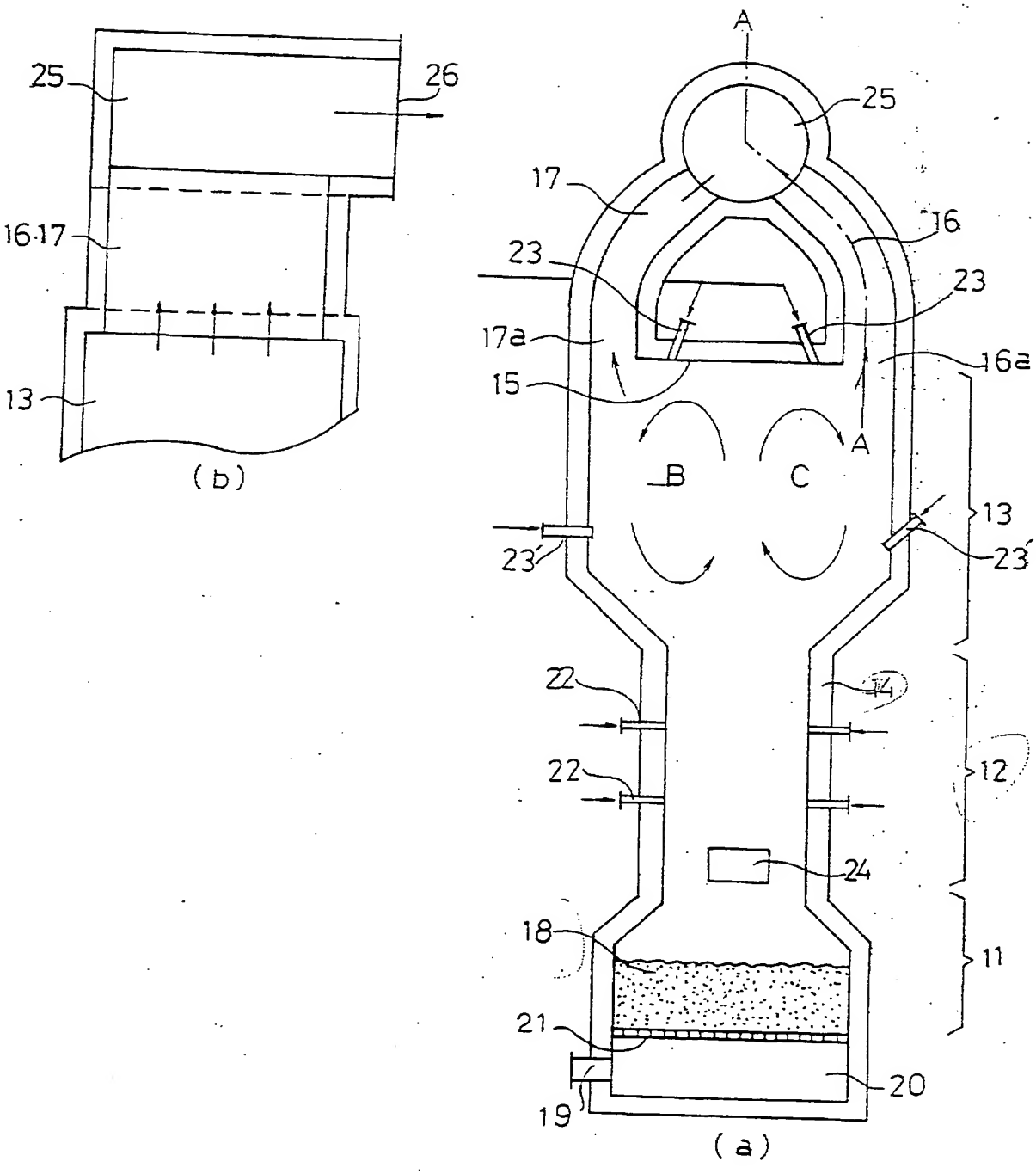
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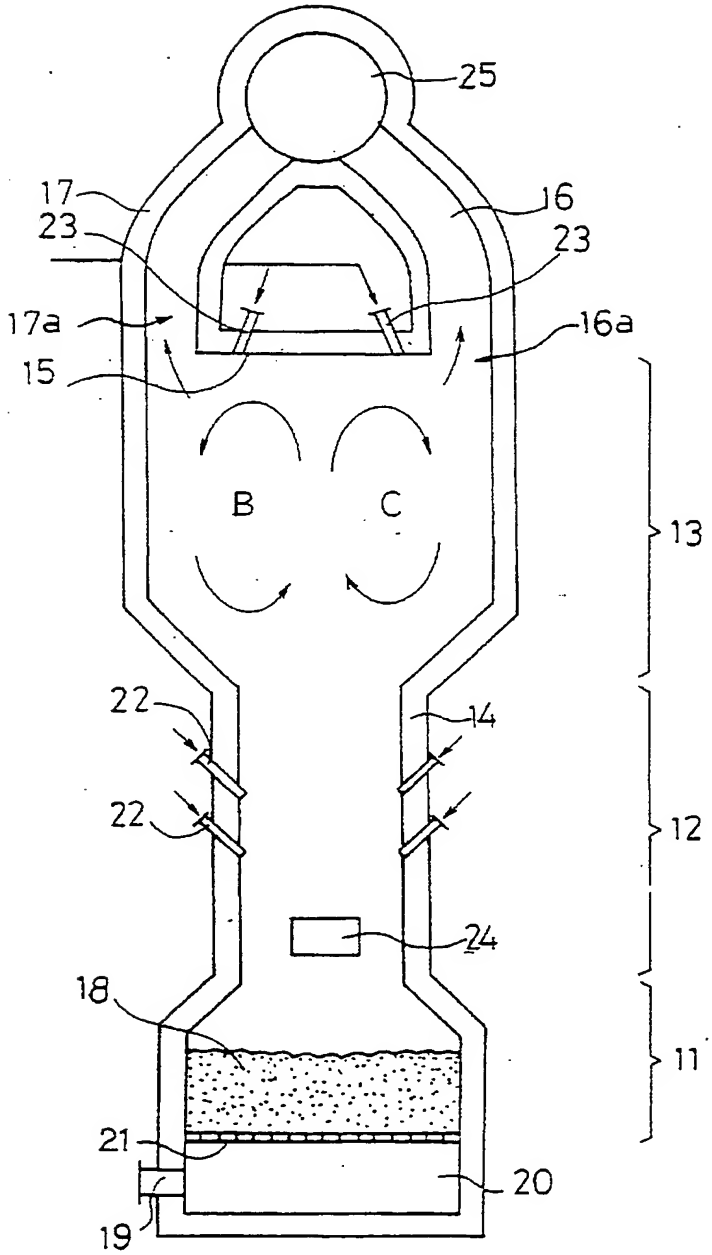
Fig 2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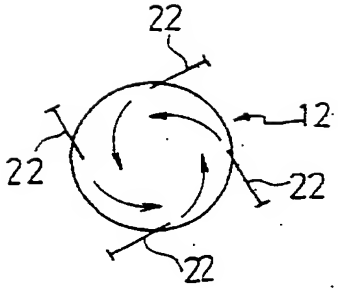
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(b)